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The epidural analgesic effects of Meloxicam in dogs

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Abstract

Epidural analgesia is an effective and frequent method used to induce analgesia in perineal region during orthopedic or obstetric procedures of pain management. 18 healthy mixed-breed dogs, were randomly divided into three groups. Lumbosacral epidural analgesia was performed in all dogs in the following order: lidocaine (0.2 mg/kg) in group A, meloxicam (0.1 mg/kg) in group B and the combination of both drugs in group C. Heart rate, respiratory rate and body temperatures were recorded for every 5 minutes, while analgesia onset time, duration of analgesia and paralysis were also recorded in all dogs. Without any systemic complications, no significant difference was observed in mean heart rate, respiratory rate and body temperature in all groups ($p>0.05$). Duration of analgesia was significantly lower in group B (59 ± 15) compared to group A (109±10) and C (127± 24) ($p<0.05$). Moreover, paralysis did not occur in group B. It is concluded that meloxicam is effective and safe in inducing epidural analgesia in dogs. Although sensory block occurred during epidural analgesia, motor block and paralysis of the legs did not occur. Therefore further studies using the higher concentration of the drug are recommended. Also the drug does not enhance the duration of analgesia induced by lidocaine.

Keywords: Epidural analgesia, meloxicam, lidocaine, dog

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Introduction

Many efforts have been made to realize and prevent pain in animals using different drugs. Epidural is an effective route to lower the pain and sensation by injecting drugs into the epidural space. Many analgesics and their combinations have been suggested to inject into the epidural space in order to control either acute or chronic pain.[1, 2]). Preoperative epidural administration of analgesics not only provides preemptive and intraoperative analgesia, but also creates excellent postoperative analgesia with prolonged duration of effect .[3, 4]

Meloxicam is a non- steroid anti-inflammatory drug (NSAID) with analgesic properties that exerts its analgesic effect by inhibiting cyclooxygenase enzyme (COX). This enzyme is an important component of arachidonic acid pathway, which leads to the synthesis of prostaglandins and the induction of pain. Because meloxicam is a COX-2 preferential NSAID, it is less harmful to renal and gastrointestinal system, so it is advantageous to be administered epidurally.[5, 6]. Evidence suggests that COX- 2 is the dominant COX isoform in the spinal cord and is associated the recognition of pain by central nervous system during inflammation.[7]Therefore the use of the drugs that have more affinity to COX-2 is preferred compared to the drugs without any selective activity to COX due to their less side effects.[8]

Many reports are existed in literature regarding analgesic properties of Meloxicam in dogs.[9, 10, 11, 12] In spite of the fact that the drug is analgesic and has been proved to function more selective to COX-2, very limited reports are available regarding its epidural administration. Gangwar *et al.* in 2008 performed successful epidural by meloixam and concluded that it can be used safe into the epidural space for the treatment of hock joint lameness in bovine without any toxicity or side effects.[13]

The objective of this study was to investigate the analgesic efficacy of meloxicam used into the epidural space. Also to evaluate whether the combination of the drug with Lidocaine could potentially improve its analgesic effects.

Materials and methods

Animals:

18 healthy adult mixed breed dogs weighting 14±2 kg were included in the study. The dogs were randomly divided into three groups. All experimental procedures were approved by the University Research Committee in accordance with the guidelines of its Institutional Animal Experimentation Ethics Committee.

Procedure:

The dogs were physically restrained by a technician and ventrally positioned. After aseptic preparation of the area, the skin and muscles of the injecting area was desensitized using 2 ml of Lidocaine (2%, Pasture Institute, Iran). Epidural injections were performed thorough the deepest area in lumbosacral junction via a 50 mm, 20 gauge epidural needle. Legs were flexed so that maximum exposure of the lumbosacral space was achieved. Hanging drop technique was used to confirm that the needle is located into the epidural space. The epidural injection was performed in all dogs in the following order: Lidocaine (2%, Pasture Institute, Iran 0.2 mg/kg) in group A, Meloxicam (7.5 mg/ml, Boehringer-Ingelheim, Germany, 0.1 mg/kg) in group B and the combination of both drugs in group C. Heart rate/min, respiratory rate/min and body temperature were recorded for every 5 minutes. Moreover, analgesia onset time and duration of analgesia including sensory loss, by inserting the painful stimulation (pinprick) for every 3 minutes, as well as motor loss (if occurred), the time between recumbency to standing position were recorded in all dogs.

Statistics:

Mean of the measured variables were compared among groups and within group

using analysis of variances (ANOVA). Then *Banferroni* test was performed for pair wise comparison between means. The *p* values less than 0.05 were considered statistically significant.

Result

There was no clinical or neurological complication like ataxia or weakness during or after inducing epidural analgesia in all dogs. No significant difference was observed in Mean±SD heart rate, respiratory rate and body temperature between all groups ($p>0.05$). Analgesia onset time was 4.4 ±1.4 min in group A, 4.6± 0.9 min in group B and 4± 0.3 in group C. No significant different was reported related to time to onset of action of the drugs among groups ($p= 0.8$). Duration of sensory loss was significantly lower in group B (59 ± 15 min) compared to group A (109±10 min) or C (127± 24 min) ($P=0$). Motor loss and paralysis did not occur in group B. In addition, the duration of motor loss was not significantly different between group A and C ($p>0.05$). Results are illustrated in table 1.

Table 1- Mean and standard deviation of the measured variables after administration of drugs to induce epidural analgesia

Groups/Parameters	Group A 2% Lidocaine	Group B Meloxicam	Group C Combination of 2 % lidocaine and meloxicam
Onset time to analgesia (min)	4.4±1.4[a]	4.6±0.9[b]	4±0.3[a]
Duration of paralysis (min)	76±21[c]	Not assigned	89±15[c]
Duration of analgesia (min)	109±10[d]	59±15[e]	127±24[d]

The measured variables in groups with the common superscripts were not significantly different from each other at the 0.05 significance level.

Discussion

The efficacy of meloxicam to induce epidural analgesia in dogs, in addition to its effects when used in combination with lidocaine was assessed in the present study. NSIAD like ibuprofen, diclofenac, deraxcoxib and lornoxicam reported to have satisfactory effects to induce epidural analgesia in laboratory animals and dogs.[6, 8, 14, 15] Results of the present study confirms safe induction of epidural analgesia by the use of meloxicam. Meloxicam did not affect or speed up the time to onset analgesia of lidocaine in epidural injection. Because the duration of sensory loss was not significantly extended when the drug used in combination with lidocaine, we concluded that the drug did not potentiate the analgesic effect of lidocaine. Therefore it is not advantageous when meloxicam is used in combination with lidocaine. This effect has been widely reported when the combination of lidocaine with opioids is considered.[1, 2]

Loss of pain without recumbency is an interesting subject in medicine. In epidural analgesia, the degree of sensory block and motor block increases when the concentration of the administered drug increases.[2, 8] Management of the pain thorough administration of the drugs in to the epidural space is indicated in patients suffering from chronic pain like ostheoarthritis or cancerous pain. Also in many procedures like tail amputation, painful obstetric manipulations, or post-operative pain management paralysis of the legs is not necessary.[3] Motor loss did not occur when meloxicam was used alone in group B. This is not clear whether meloxicam does not affect motor neurons in the spinal cord or increasing concentration of the drug is needed to produce motor block. However the later is more probable. Similar reports are existed regarding lack of motor loss when ropivacaine is used in epidural analgesia.[16,17]. By increasing the concentration of ropivacaine, analgesia was more extensive, and motor block was considered moderate.[17] Canduz *et al* in 2007 used different concentration of lornoxicam, the newly introduced NSIAD, in rabbits via epidural catheter and concluded that dose dependent analgesia and brief, mild, motor and sensory dysfunction can be provided.[6]

Being a COX 2 preferential NSAID besides lack of motor block in the epidural injection of 0.1 mg/kg, 7.5 mg/1 ml meloxicam in this study makes it an interesting and appropriate drug for post-operative pain relief. Epidural injection of the higher concentration of meloxicam might lengthen the duration of analgesia or even causes motor loss. Therefore further investigation of the higher concentration and dose response of sensory and/or motor block of meloxicam are recommended.

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بررسی اثرات بی دردی داروی ملوکسیکام به روش اپیدورال در سگ

آذین توکلی

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چکیده

بی حسی اپیدورال یکی از راههای موثر در ایجاد بی دردی است که به صورت گسترده ای در راستای ایجاد بی دردی در نواحی پرینال و اندام حرکتی خلفی در جراحی های ارتوپدی، پروسه های مامایی و مدیریت درد استفاده می شود. ۱۸ قلاده سگ سالم و بالغ از نژاد مخلوط بومی ایران، به صورت تصادفی به سه گروه مساوی تقسیم شدند. بی حسی اپیدورال در تمامی سگها به ترتیب زیر انجام شد : لیدوکایین (۰.۲ میلی گرم به ازای هر کیلوگرم وزن بدن) در گروه اول، ملوکسیکام (۰.۱ میلی گرم به ازای هر کیلوگرم وزن بدن) در گروه دوم و ادغام هر دو داروی فوق در گروه سوم تجویز شد. هر ۵ دقیقه یکبار، تعداد ضربان قلب در دقیقه، تعداد تنفس در دقیقه و دمای بدن در کلیه سگها اندازه گیری و ثبت شد. همچنین مدت زمان شروع بی دردی و طول دوره بی دردی و فلجی (در صورت بروز) ثبت شد. هیچ عارضه ای حین ایجاد و در طول بی دردی اپیدورال مشاهده نشد. پس از آنالیز نتایج، اختلاف معنی داری در میانگین تعداد ضربان قلب در دقیقه، تعداد تنفس در دقیقه و دمای بدن مشاهده نشد. (p>0.05). طول دوره بی دردی در گروه دوم(۱۵±۵۹) دقیقه به صورت معنی داری کمتر از گروه اول(۱۰±۱۰۹) دقیقه و سوم (۲۴±۱۲۷) دقیقه بود. (p <0.05) . همچنین فلجی پاهای خلفی در گروه دوم مشاهده نشد. در نتیجه داروی ملوکسیکام در ایجاد بی دردی اپیدورال در سگها موثر و مطمین می باشد. اگرچه بی حسی در طول دوره بی دردی اپیدورال ایجاد شد اما بی حسی حرکتی و فلجی در سگهای گروه دوم مشاهده نشد. بدین ترتیب مطالعات بیشتر با استفاده از غلظتهای بالاتر داروی ملوکسیکام توصیه می شود. همچنین این دارو موجب افزایش طول دوره بی دردی در ادغام با لیدوکایین نگردید.

واژگان کلیدی: اپیدورال، ملوکسیکام، لیدوکایین، سگ